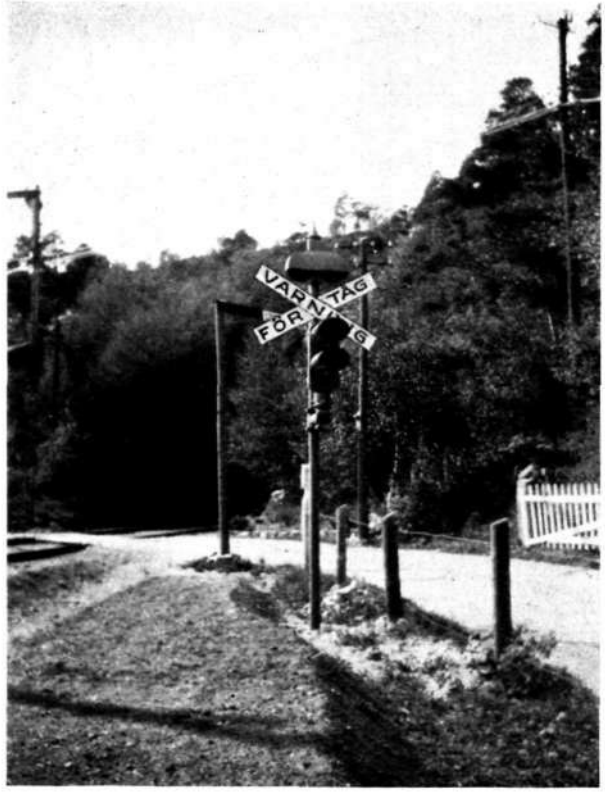
Automatic Warning Signals at the Railway Crossing near the Henriksdal station on the Stockholm—Saltsjön Railway.

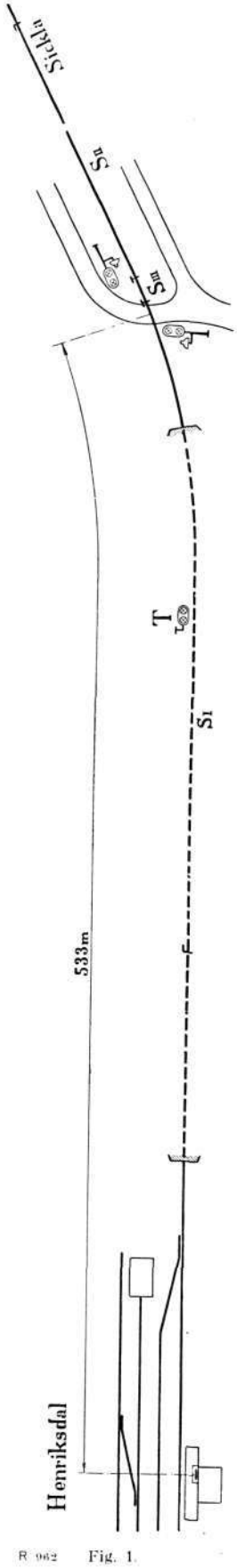
In an attempt to reduce operating expenses, the Stockholm—Saltsjön Railway has decided to replace the guards at the grade crossings with an automatic signalling system. The cost for protecting the crossings with guards — at least two men being required per crossing and day — is relatively high on account of the heavy traffic, trains being run at close intervals during both day and night except during a very few hours. A comparison between the operating and amortization costs for an automatic signalling system on the one side, and the cost of maintaining crossing guards, on the other, proved the advantage of adopting automatic signal protection. A grade crossing just East of the tunnel near the Henriksdal station has now been provided with automatic warning signals. Since this crossing is quite close to the tunnel entrance, thereby cutting off a clear view of the crossing from the road, it is especially dangerous for the heavy automobile traffic. On account of this the requirements to be filled by the signalling system were exceptionally strict and it was decided to use intermittent flashing signals combined with warning bells. The light signals — one on each side of the tracks — show a white flashing light which changes to red on the approach of a train, when vehicles and pedestrians are not permitted to cross the tracks. The warning bell is mounted on the same pole as the light signal. One of the signal poles, bearing the crossed sign required by law, is shown in fig. 2.



R 966 Fig. 2.

R 964 Fig. 3.

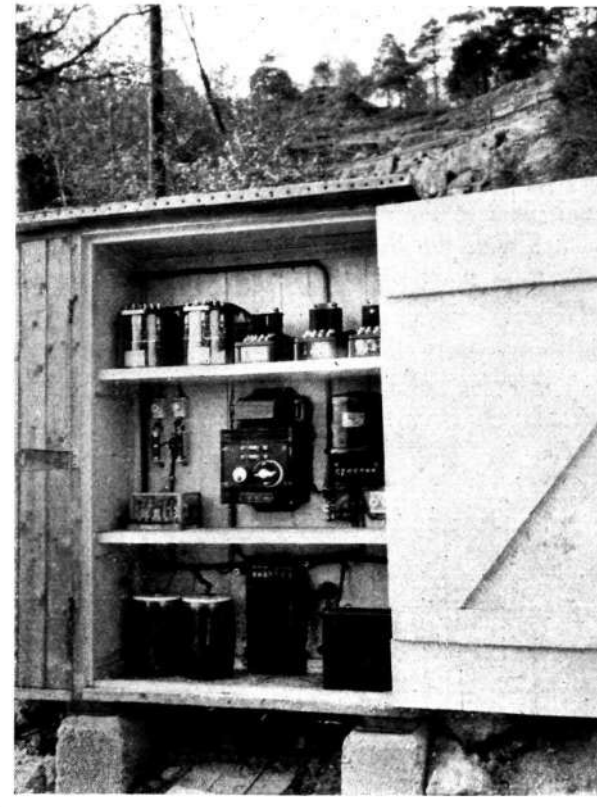
»Signalbolaget» was entrusted with the work of



R 962 Fig. 1.

preparing estimates for the plant, the project being based on constant and uninterrupted track circuits (S_I and S_{II} in fig. 1). It was necessary, however, to take into consideration the fact that the railway was electrified, the traction current having a tension of 1300 volts D. C. and the rails serving as return conductors. For this reason single phase A. C. was adopted as feed current for the track circuits. Only one of the rails has been used for this purpose and been divided into insulated sections, one for each of the track circuits S_I, S_{II} and S_{III}, the other rail having been left unchanged to serve as return for both traction and signal current.

The crossing being situated so near to the station, and since it was found desirable that the warning signals should not be made to function during normal switching movements when the train does not go up to or pass over the crossing, it was found impossible to make track section S_I of sufficient length for the automatic switching on of the warning signals within the time prescribed by law (at least thirty seconds before the train reaches the crossing) to give warning of the approach with normal speed of a train just leaving the Henriksdal station. This problem has been solved by installing a plunger key in the signal cabin at Henriksdal, in which the interlocking machine is housed, by means of which — with the aid of a relay — the signal plant can be switched on for the giving of a warning signal within the prescribed time even though no train has entered on track section S_I. In order to make it possible for the locomotive engineer of such a train to verify that the warning signals have been switched on at Henriksdal, a light signal — *T* in fig. 1 — has been set up in the tunnel, the lamps of this signal being connected in series with the signal lamp at the crossing so as to show a white flashing light when the warning signals show red,



R 965 Fig. 4.

and an orange flashing light when the warning signals show white. As soon as the train reaches the track section S_I, the auxiliary relay co-operating with the plunger key in the signal cabin is disconnected and the system functions quite automatically. Thus, the signals again show a white flashing light and the warning bells cease to ring as soon as the train leaves track sections S_I and S_{III}. When the train has also left section S_{II}, the entire system is restored to normal. If the engineer of a train leaving Henriksdal should observe an orange coloured light signal at *T*, he must cut down the speed of the train to 25 km. per hour as soon as the train enters on track

section S_I and the warning signals are automatically switched on in order that the length of the time which elapses before the train reaches the crossing shall fill the requirements of the law. When a train approaches from the other direction the signal system functions quite automatically, the warning signals being switched on as soon as the train enters section S_{II} and switched off when the train has completely left sections S and S^I_{II}.

In order to be able to verify at the Henriksdal station that the warning signals at the railway crossing are in good working order, the same board on which the above-mentioned plunger key is mounted (see fig. 3) has been provided with supervisory lamps in series with both the white and red crossing signal lamps, while in the office of the station master a lamp and a buzzer have been mounted in series with the red signal lamps. Besides supervising the condition of the signal plant at the crossing, the last mentioned lamp together with the buzzer announce the approach of trains from the East in a most satisfactory manner. All the supervisory lamps are provided with a shunt resistance, thereby eliminating any danger of the warning signals at the crossing being extinguished in case a supervisory lamp is removed or has become broken.

The relays for this plant are mounted in a cabinet (fig. 4) which has been placed close to the railway crossing. The track circuits S_I and S_{II} — as already mentioned — are fed by single phase alternating current, the relays which serve this purpose and which are mounted on top and to the left in the cabinet being specially adapted therefore. The remaining ones are all D. C. relays. The necessary A. C. is obtained from the existing service net and is transformed down to a suitable voltage for the track circuits and signal lamps. Direct current for the other relays and the warning bells is obtained from a storage battery which is under constant charging from the A. C. net by means of a rectifier mounted in the middle of the cabinet in fig. 4. This is a so called metallic rectifier, noted for its sturdy construction, absence of moving parts and lamps, and for the fact that it requires no attention whatever after once having been correctly adjusted; also, it functions with such precision that the well-known saying 'install and forget' may well be applied to the same.

This plant has been in service since the beginning of 1928 and has given entire satisfaction with respect to the manner in which it has functioned as well as from an economical point of view.

Stockholm 1929. Kurt Lindberg, Boktryckeriaktiebolag.